

# Leica GS14

## User Manual



Version 2.1  
English

- when it has to be **right**

**Leica**  
Geosystems

# Introduction

## Purchase

Congratulations on the purchase of a Leica GS14 GNSS instrument.



This manual contains important safety directions as well as instructions for setting up the product and operating it. Refer to "1 Safety Directions" for further information. Read carefully through the User Manual before you switch on the product.

## Product identification

The type and serial number of your product are indicated on the type plate. Always refer to this information when you need to contact your agency or Leica Geosystems authorised service workshop.



## Trademarks



- Windows is a registered trademark of Microsoft Corporation in the United States and other countries
  - *Bluetooth*<sup>®</sup> is a registered trademark of Bluetooth SIG, Inc.
  - microSD Logo is a trademark of SD-3C, LLC.
- All other trademarks are the property of their respective owners.

## Validity of this manual

This manual applies to all models of the GS14 GNSS instrument. Where there are differences between the various instruments they are clearly described.

## Available documentation

Name	Description/Format		
GS14 Quick Guide	Provides an overview of the product together with technical data and safety directions. Intended as a quick reference guide.	✓	✓
GS14 User Manual	All instructions required in order to operate the product to a basic level are contained in the User Manual. Provides an overview of the product together with technical data and safety directions.	-	✓

Name	Description/Format		
Viva Series Technical Reference Manual	Overall comprehensive guide to the product and application functions. Included are detailed descriptions of special software/hardware settings and software/hardware functions intended for technical specialists.	-	✓

### Refer to the following resources for all GS14 documentation/software:

- the Leica USB documentation card
- <https://myworld.leica-geosystems.com>

myWorld@Leica Geosystems (<https://myworld.leica-geosystems.com>) offers a wide range of services, information and training material.

With direct access to myWorld, you are able to access all relevant services whenever it is convenient for you, 24 hours a day, 7 days per week. This increases your efficiency and keeps you and your equipment instantly updated with the latest information from Leica Geosystems.

Service	Description
myProducts	Add all Leica Geosystems products that you and your company own. View detailed information on your products, buy additional options or Customer Care Packages (CCPs), update your products with the latest software and keep up-to-date with the latest documentation.
myService	View the service history of your products in Leica Geosystems Service Centres and detailed information on the services performed on your products. For your products that are currently in Leica Geosystems Service Centres view the current service status and the expected end date of service.
mySupport	Create new support requests for your products that will be answered by your local Leica Geosystems Support Team. View the complete history of your Support and view detailed information on each request in case you want to refer to previous support requests.
myTraining	Enhance your product knowledge with the Leica Geosystems Campus - Information, Knowledge, Training. Study the latest online training material or download training material on your products. Keep up-to-date with the latest News on your products and register for Seminars or Courses in your country.
myTrustedServices	Offers increased productivity while at the same time providing maximum security. <ul style="list-style-type: none"> <li>• myExchange With myExchange you can exchange any files/objects from your computer to any of your Leica Exchange Contacts.</li> <li>• mySecurity If your instrument is ever stolen, a locking mechanism is available to ensure that the instrument is disabled and can no longer be used.</li> </ul>

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# 1 Safety Directions

## 1.1 General Introduction

**Description** The following directions enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

### About Warning Messages





Warning messages are an essential part of the safety concept of the instrument. They appear wherever hazards or hazardous situations can occur.

#### Warning messages...

- make the user alert about direct and indirect hazards concerning the use of the product.
- contain general rules of behaviour.

For the users' safety, all safety instructions and safety messages shall be strictly observed and followed! Therefore, the manual must always be available to all persons performing any tasks described herein.

**DANGER, WARNING, CAUTION** and **NOTICE** are standardized signal words for identifying levels of hazards and risks related to personal injury and property damage. For your safety it is important to read and fully understand the table below with the different signal words and their definitions! Supplementary safety information symbols may be placed within a warning message as well as supplementary text.

Type	Description
 <b>DANGER</b>	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 <b>WARNING</b>	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
 <b>CAUTION</b>	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury.
<b>NOTICE</b>	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in appreciable material, financial and environmental damage.
	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

## 1.2

## Definition of Use

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### Intended use

- Computing with software.
- Recording measurements.
- Carrying out measurement tasks using various GNSS measuring techniques.
- Recording GNSS and point related data.
- Remote control of product.
- Data communication with external appliances.
- Measuring raw data and computing coordinates using carrier phase and code signal from GNSS satellites.

### Reasonably foreseeable misuse

- Use of the product without instruction.
- Use outside of the intended use and limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with recognisable damages or defects.
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems.
- Inadequate safeguards at the working site.
- Controlling of machines, moving objects or similar monitoring application without additional control- and safety installations.

## 1.3

## Limits of Use

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### Environment

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments.



### DANGER

Local safety authorities and safety experts must be contacted before working in hazardous areas, or close to electrical installations or similar situations by the person in charge of the product.

## 1.4

## Responsibilities

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### Manufacturer of the product

Leica Geosystems AG, CH-9435 Heerbrugg, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the user manual and original accessories, in a safe condition.

### Person responsible for the product

The person responsible for the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- To ensure that it is used in accordance with the instructions.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Leica Geosystems immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of e.g. radio transmitters or lasers are respected.

**DANGER**

Because of the risk of electrocution, it is dangerous to use poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.

**Precautions:**

Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.

**WARNING**

During dynamic applications, for example stakeout procedures there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.

**Precautions:**

The person responsible for the product must make all users fully aware of the existing dangers.

**WARNING**

Inadequate securing of the working site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations.

**Precautions:**

Always ensure that the working site is adequately secured. Adhere to the regulations governing safety and accident prevention and road traffic.

**CAUTION**

If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people can sustain injury.

**Precautions:**

When setting-up the product, make sure that the accessories are correctly adapted, fitted, secured, and locked in position.

Avoid subjecting the product to mechanical stress.

**WARNING**

If the product is used with accessories, for example masts, staffs, poles, you may increase the risk of being struck by lightning.

**Precautions:**

Do not use the product in a thunderstorm.

**DANGER**

If the product is used with accessories, for example on masts, staffs, poles, you may increase the risk of being struck by lightning. Danger from high voltages also exists near power lines. Lightning, voltage peaks, or the touching of power lines can cause damage, injury and death.

**Precautions:**

- Do not use the product in a thunderstorm as you can increase the risk of being struck by lightning.
- Be sure to remain at a safe distance from electrical installations. Do not use the product directly under or close to power lines. If it is essential to work in such an environment contact the safety authorities responsible for electrical installations and follow their instructions.
- If the product has to be permanently mounted in an exposed location, it is advisable to provide a lightning conductor system. A suggestion on how to design a lightning conductor for the product is given below. Always follow the regulations in

force in your country regarding grounding antennas and masts. These installations must be carried out by an authorised specialist.

- To prevent damages due to indirect lightning strikes (voltage spikes) cables, for example for antenna, power source or modem should be protected with appropriate protection elements, like a lightning arrester. These installations must be carried out by an authorised specialist.
- If there is a risk of a thunderstorm, or if the equipment is to remain unused and unattended for a long period, protect your product additionally by unplugging all systems components and disconnecting all connecting cables and supply cables, for example, instrument - antenna.

## Lightning conductors

Suggestion for design of a lightning conductor for a GNSS system:

### 1) On non-metallic structures

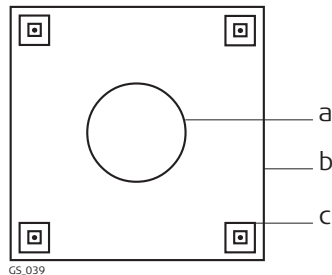
Protection by air terminals is recommended. An air terminal is a pointed solid or tubular rod of conducting material with proper mounting and connection to a conductor. The position of four air terminals can be uniformly distributed around the antenna at a distance equal to the height of the air terminal.

The air terminal diameter should be 12 mm for copper or 15 mm for aluminium. The height of the air terminals should be 25 cm to 50 cm. All air terminals should be connected to the down conductors. The diameter of the air terminal should be kept to a minimum to reduce GNSS signal shading.

### 2) On metallic structures

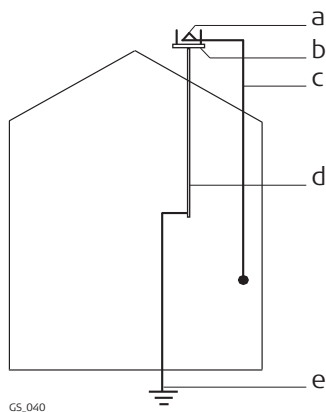
Protection is as described for non-metallic structures, but the air terminals can be connected directly to the conducting structure without the need for down conductors.

## Air terminal arrangement, plan view



- a) Antenna
- b) Support structure
- c) Air terminal

## Grounding the instrument/antenna



- a) Antenna
- b) Lightning conductor array
- c) Antenna/instrument connection
- d) Metallic mast
- e) Connection to earth



## WARNING

During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

### Precautions:

Before shipping the product or disposing of it, discharge the batteries by running the product until they are flat.

When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping contact your local passenger or freight transport company.



## WARNING

High mechanical stress, high ambient temperatures or immersion into fluids can cause leakage, fire or explosions of the batteries.

### Precautions:

Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.



## WARNING

If battery terminals are short circuited e.g. by coming in contact with jewellery, keys, metalized paper or other metals, the battery can overheat and cause injury or fire, for example by storing or transporting in pockets.

### Precautions:

Make sure that the battery terminals do not come into contact with metallic objects.



## WARNING

Incorrect fastening of the external antenna to vehicles or transporters poses the risk of the equipment being broken by mechanical influence, vibration or airstream. This may result in accident and physical injury.

### Precautions:

Attach the external antenna professionally. The external antenna must be secured additionally, for example by use of a safety cord. Ensure that the mounting device is correctly mounted and able to carry the weight of the external antenna (>1 kg) safely.



## WARNING

If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

### Precautions:



The product must not be disposed with household waste.

Dispose of the product appropriately in accordance with the national regulations in force in your country.

Always prevent access to the product by unauthorised personnel.

Product-specific treatment and waste management information can be downloaded from the Leica Geosystems home page at <http://www.leica-geosystems.com/treatment> or received from your Leica Geosystems dealer.



## WARNING

Only Leica Geosystems authorised service workshops are entitled to repair these products.

**Description**

The term Electromagnetic Compatibility is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances to other equipment.

**WARNING**

Electromagnetic radiation can cause disturbances in other equipment.

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed.

**CAUTION**

There is a risk that disturbances may be caused in other equipment if the product is used with accessories from other manufacturers, for example field computers, personal computers or other electronic equipment, non-standard cables or external batteries.

**Precautions:**

Use only the equipment and accessories recommended by Leica Geosystems. When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers or other electronic equipment, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

**CAUTION**

Disturbances caused by electromagnetic radiation can result in erroneous measurements.

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that the product may be disturbed by intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators.

**Precautions:**

Check the plausibility of results obtained under these conditions.

**CAUTION**

If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.

**Precautions:**

While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

## Radios or digital cellular phones



### WARNING

Use of product with radio or digital cellular phone devices:

Electromagnetic fields can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircraft. It can also affect humans and animals.

#### Precautions:

Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment can be disturbed or that humans or animals can be affected.

- Do not operate the product with radio or digital cellular phone devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- Do not operate the product with radio or digital cellular phone devices near to medical equipment.
- Do not operate the product with radio or digital cellular phone devices in aircraft.

## 1.7

### FCC Statement, Applicable in U.S.



The greyed paragraph below is only applicable for products without radio.



### WARNING

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

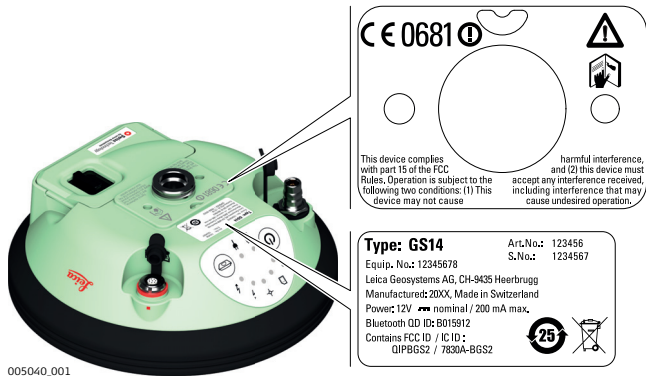
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



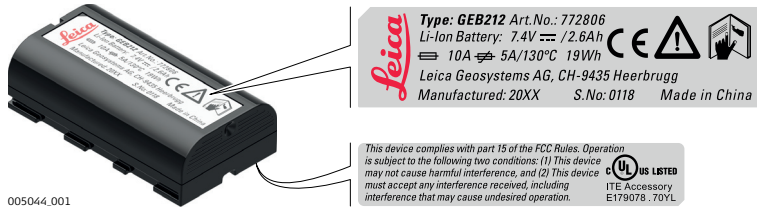
### WARNING

Changes or modifications not expressly approved by Leica Geosystems for compliance could void the user's authority to operate the equipment.

Labelling GS14



Labelling internal battery GEB212



This Class (B) digital apparatus complies with Canadian ICES-003.  
Cet appareil numérique de la classe (B) est conforme à la norme NMB-003 du Canada.

## 2

## Description of the System

### 2.1

### System Components

#### Main components

Component	Description
Instrument	To calculate a position from the computed ranges to all visible GNSS (Global Navigation Satellite System) satellites.
Web server	Web-based tool to preprogram the GNSS instrument.
Antenna	To receive the satellite signals from the GNSS satellites.
Leica Geo Office	The office software including a series of help programs which support working with Leica Viva Series instruments.

#### Instrument

Instrument	Description
GS14	GPS, GLONASS, BeiDou and Galileo GNSS receiver, dual frequency, SBAS (EGNOS, WAAS, MSAS, GAGAN), code and phase, real-time capable

### 2.2

### System Concept

#### 2.2.1

#### Software Concept

#### Description

All instruments use the same software concept.


#### Software for all GS GNSS instruments

Software type	Description
GS firmware (GS_xx.fw)	This important software covers all functions of the instrument. The Web server application is integrated into the firmware and cannot be deleted. The English language is integrated into the firmware and cannot be deleted.
Language software (WEB_LANG.sxx)	Numerous languages are available for the Web server application. The English language is the default language. One language is chosen as the active language.

#### Software upload



Uploading GS firmware can take some time. Ensure that the battery is at least 75% full before beginning the upload, and do not remove the battery during the upload process.

Software for	Description
All GS models	The software can be uploaded using the Leica Web server application or myWorld@Leica Geosystems.  Ensure that a Leica microSD card is inserted into the GS instrument before starting the upload. Refer to "4.3 Working with the Memory Device".

## 2.2.2

## Power Concept

### General

Use the batteries, chargers and accessories recommended by Leica Geosystems to ensure the correct functionality of the instrument.

### Power options

Power for the instrument can be supplied either internally or externally. Up to two external power supplies can be connected.

Internal power supply: One battery (GEB211 or GEB212) fits into the instrument.

External power supply: GEB171 battery connected via a cable.  
OR  
Car battery connected via a converter cable supplied by Leica Geosystems.  
OR  
10.5 V-28 V DC power supply via a converter cable supplied by Leica Geosystems.  
OR  
110 V/240 V AC to 12 V DC power supply unit, supplied by Leica Geosystems.



For permanent operations use **Uninterruptible Power Supply** units as a back-up in a main power failure.

## 2.2.3

## Data Storage Concept

### Description

Data (Leica GNSS raw data and RINEX data) can be recorded on the microSD card.

### Memory device

microSD card: The GS14 GNSS instrument has a microSD card slot fitted as standard. A microSD card can be inserted and removed.  
Available capacity: 1 GB



While other microSD cards can be used, Leica Geosystems recommends to only use Leica microSD cards and is not responsible for data loss or any other error that can occur while using a non-Leica card.

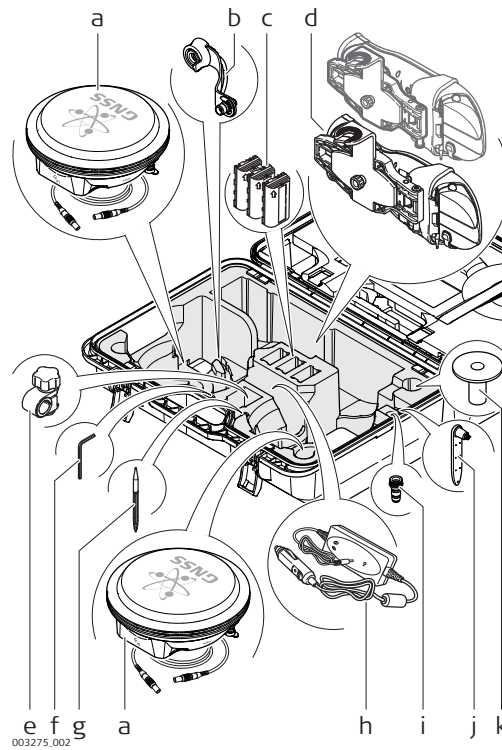


Unplugging connecting cables, removing the data storage device or interrupting the power supply during the measurement can cause loss of data. Only remove the data storage device, unplug connecting cables or interrupt the power supply when the GS GNSS instrument is switched off.



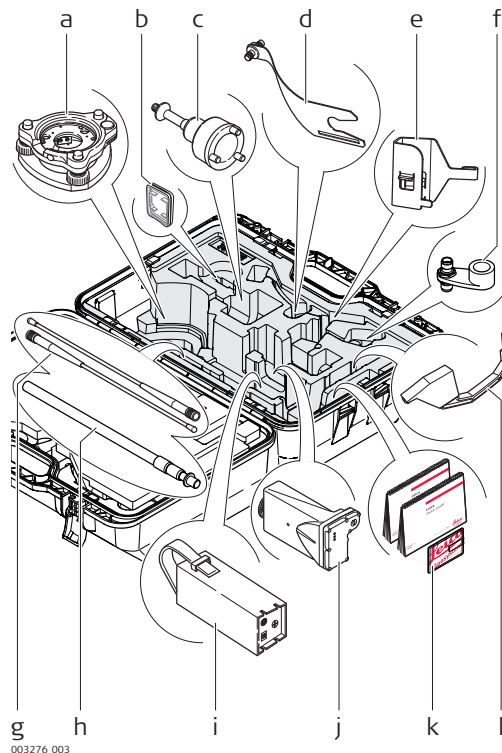
microSD cards can, with the supplied adaptor, also be used in an OMNI drive as supplied by Leica Geosystems. Other PC card drives can require an adaptor.

**Container for  
GS08plus/GS12/  
GS14 instrument  
and accessories 1/2**



- a) GS08plus/GS12/GS14 GNSS antenna and cable
- b) GAD108 arm
- c) GEB211/GEB212 batteries
- d) CS field controller with CGR radio cap and GHT62 holder for CS field controller on pole
- e) GHT63 clamp
- f) Allen key
- g) Supplied stylus
- h) GDC221 car adapter
- i) TNC QN-adapter
- j) GAT21 antenna
- k) GHT36 base for telescopic rod

**Container for  
GS08plus/GS12/  
GS14 instrument  
and accessories 2/2**



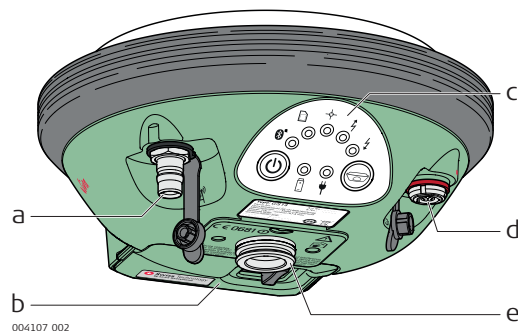
- a) Tribrach
- b) SD card/CompactFlash card
- c) GRT146 carrier
- d) GAD33 arm 15 cm
- e) GHT58 tripod bracket for GFU housing
- f) GAD34 arm 3 cm
- g) Antennas of device
- h) GAD32 telescopic antenna rod
- i) GEB171 battery
- j) GFU device such as radio
- k) Manual & USB documentation card
- l) Height hook



The instrument can be preprogrammed using the Web server application running from the instrument on a web browser of a Windows device. Connect the instrument to a computer using a cable. Turn on the instrument by holding down the Power key for 2 s. A green blinking light at both power LEDs indicates that the instrument powers up.

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### GS14 components



- a) QN-connector for external UHF antenna, only for models with UHF radio
- b) Battery compartment with microSD and SIM card slot
- c) LEDs, ON/OFF button and Function button
- d) LEMO port, serial and USB
- e) Mechanical Reference Plane (MRP)



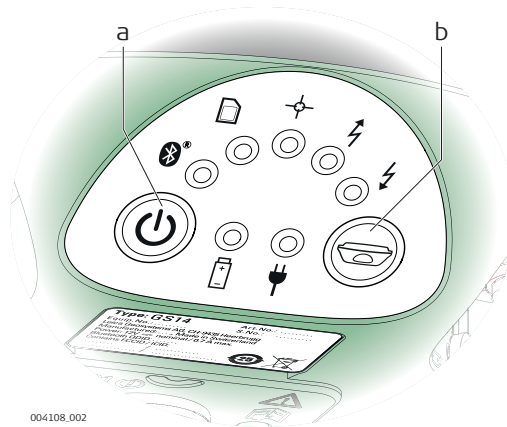
A Bluetooth port is included inside all GS GNSS instruments to enable connectivity to the CS10/CS15 field controller.

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## 3 User Interface




### 3.1 Keyboard

#### Keyboard GS14




a) ON/OFF button  
b) Function button

#### ON/OFF button

Button	Function
ON/OFF 	<p>If GS14 already off: Turns on GS14 when held for 2 s.</p> <p> While the GS14 is booting the two Power LEDs are lighted. Once the GS14 has started, the normal LED behaviour starts.</p> <p>If GS14 already on: Turns off GS14 when held for 2 s.</p> <p> The Storage, Position, RTK Base and RTK Rover LEDs shine red, both Power and the Bluetooth LEDs shine yellow and then are turned off.</p>



#### Function button

 All functions following described assume the GS14 is already on.

Button	Function
Function 	<p>Press and hold button for &lt; 1 s.</p> <p>If the GS14 is in:</p> <ul style="list-style-type: none"> <li>base mode: The GS14 switches to be in rover mode.</li> <li>rover mode and in static mode: The GS14 switches to be in base mode.</li> <li>rover mode and in kinematic mode: The GS14 switches to be in base mode.</li> </ul> <p>Press and hold button for 3 s.</p> <p>If the GS14 is in:</p> <ul style="list-style-type: none"> <li>base mode and a position is available: The RTK base LED flashes green for 2 s. The GS14 takes the next available position and updates the coordinates of the currently stored RTK base position.</li> <li>base mode and no position is available: The RTK base LED flashes yellow for 2 s.</li> <li>rover mode: No action.</li> </ul>

Button	Function
	<p>Press and hold button for 5 s.</p> <p>If the GS14 is in:</p> <ul style="list-style-type: none"> <li>base mode: No action.</li> <li>rover mode and configured for a dial-up or Ntrip connection: The RTK rover LED flashes green for 2 s. The GS14 will connect to the RTK base station or the Ntrip server configured.</li> <li>rover mode and not configured for a dial-up or Ntrip connection: No action.</li> </ul>

## Button combinations

Button	Function
ON/OFF 	Press and hold buttons for 1 s.
Function 	<p>The current almanacs stored on the GNSS instrument are deleted and new almanacs are downloaded. The Position LED flashes red quickly three times.</p> <p>Press and hold buttons for 5 s.</p> <p>The Memory LED flashes red quickly three times. The microSD card of the GNSS instrument is formatted. The Memory LED continues to flash red as the SD card is formatted.</p> <p>Press and hold buttons for 10 s.</p> <p>The System RAM on the GNSS instrument is formatted. Settings of all installed software will be deleted. The Storage, RTK Base and RTK Rover LEDs flash red. The Position LED flashes yellow quickly three times. After the formatting the System RAM, the GNSS instrument is turned off.</p> <p>Press and hold buttons for 15 s.</p> <p>The registry of the GNSS instrument is deleted. Windows CE and communication settings will be reset to factory defaults. The Storage, RTK Base and RTK Rover LEDs flash red. The Position LED flashes yellow quickly three times. After deleting the registry, the GNSS instrument is turned off.</p>

**Operating the instrument**

The GS14 GNSS instrument is operated either by the pressing its buttons (ON/OFF button, function button) or by the CS field controller.

**Operation by buttons**

The GS14 GNSS instrument is operated by pressing its buttons. Refer to "3.1 Keyboard" for a detailed description of the buttons and their function.

**Operation by CS field controller**

The GS14 GNSS instrument is operated by the CS field controller using the SmartWorx Viva software. Refer to the Leica CS10/CS15 User Manual or Leica Viva GNSS Getting Started Guide for a detailed description of the keys and their function.

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**Turn on GS14**

To turn on the instrument press and hold the Power button for 2 s.

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**Turn off GS14**

To turn off the instrument:

- press and hold the ON/OFF button for 2 s
  - confirm to power down the instrument when exiting SmartWorx Viva software on the CS10/CS15 field controller
-

## 4

## Operation

### 4.1

### Equipment Setup

#### 4.1.1

#### Setting up as a Post-Processing Base

##### Use

The equipment setup described is used for static operations over markers.

##### Description

The instrument can be programmed with the CS field controller before use which can then be omitted from the setup.



- The antenna is mounted directly using screw fitting. If using stub and adapter, procedures can vary slightly.
- When using the adapter and carrier, ensure that the antenna and the adapter assembly slide down the full length of the carrier stub. An incorrectly mounted antenna will have a direct effect on the results.

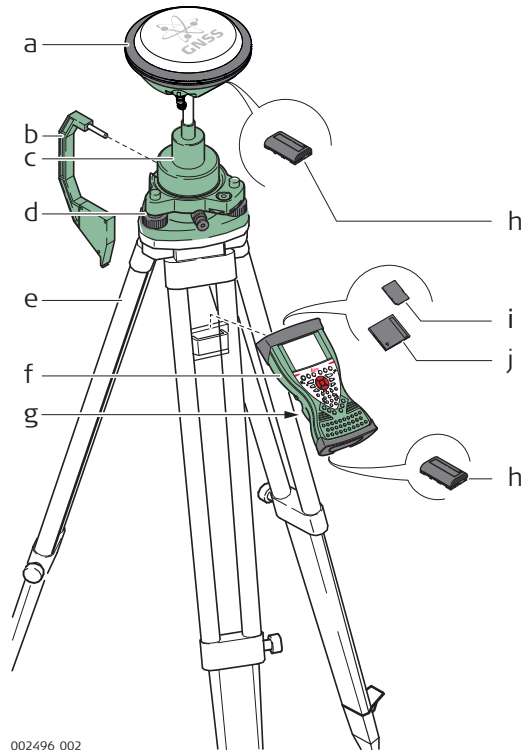


If the instrument is left in the container during use in high temperatures, the lid should be left open. Refer to the User Manual for operating and storage temperatures.



Use an external battery such as GEB171 to ensure operation for a full day.


##### Equipment setup - GS08plus/GS12/ GS14



002496\_002

- a) GS08plus/GS12/GS14 instrument
- b) Height hook
- c) GRT146 carrier
- d) Tribrach
- e) Tripod
- f) CS field controller
- g) GHT61 hand strap
- h) GEB211/GEB212 battery
- i) SD card
- j) CompactFlash card

## Equipment setup step-by-step

Step	Description	
1.	Set up the tripod.	
2.	Mount and level the tribrach on the tripod.	
3.	Ensure that the tribrach is over the marker.	
4.	Place and lock the carrier in the tribrach.	
	GS10/GS25	GS08plus/GS12/GS14/GS15
5.	Screw the GNSS antenna onto the carrier.	Insert the data storage device (only GS14/GS15) and the batteries into the GS08plus/GS12/GS14/GS15.
6.	Check that the tribrach is still level.	Screw the GS08plus/GS12/GS14/GS15 onto the carrier.
7.	Insert the batteries into the instrument.	Check that the tribrach is still level.
8.	Insert the SD card into the instrument.	Insert the data storage device and the battery into the CS field controller.
9.	Connect the instrument to the GNSS antenna using the antenna cable and port ANT on the instrument.	-
10.	Switch on the CS field controller and connect it to the instrument if necessary.  Mandatory for the GS08plus/GS12 and optional for the GS10/GS14/GS15/GS25.	
11.	To hang the instrument on the tripod leg, use the hook on the rear of the unit. Or place the instrument in the container.	To hang the CS field controller on the tripod leg, use the hook on the hand strap. Refer to the CS10/CS15 User Manual.
12.	Insert the height hook into the carrier.	
13.	Measure the antenna height using the height hook.	
14.	Press the ON/OFF button on the instrument for at least 2 s (GS25: 3 s) to switch on the instrument .	

### 4.1.2

### Setting up as a Real-Time Base

#### Use

The equipment setup described is used for real-time base stations with the need of optimal radio coverage. Raw observation data can also be collected for post-processing.

#### Description

The GS10/GS25 instrument clips to the tripod leg. Connections are made to the GNSS and radio antenna. The radio antenna is mounted on the antenna arm which clips to the GNSS antenna. The GS10/GS12/GS14/GS15/GS25 instrument can be programmed with the CS field controller before use which can then be omitted from the setup. The GS10/GS25 instrument can be used as a DGPS base station, if fitted with the DGPS option, and as a real-time base station. The connection between GS14/GS15 and CS field controller is made via Bluetooth.



- The antenna is mounted directly using screw fitting. If using stub and adapter, procedures can vary slightly.
- When using the adapter and carrier, ensure that the antenna and the adapter assembly slide down the full length of the carrier stub. An incorrectly mounted antenna will have a direct effect on the results.
- Standard radio is used throughout the instructions. Digital cellular phones can also be used but the setup can differ slightly.

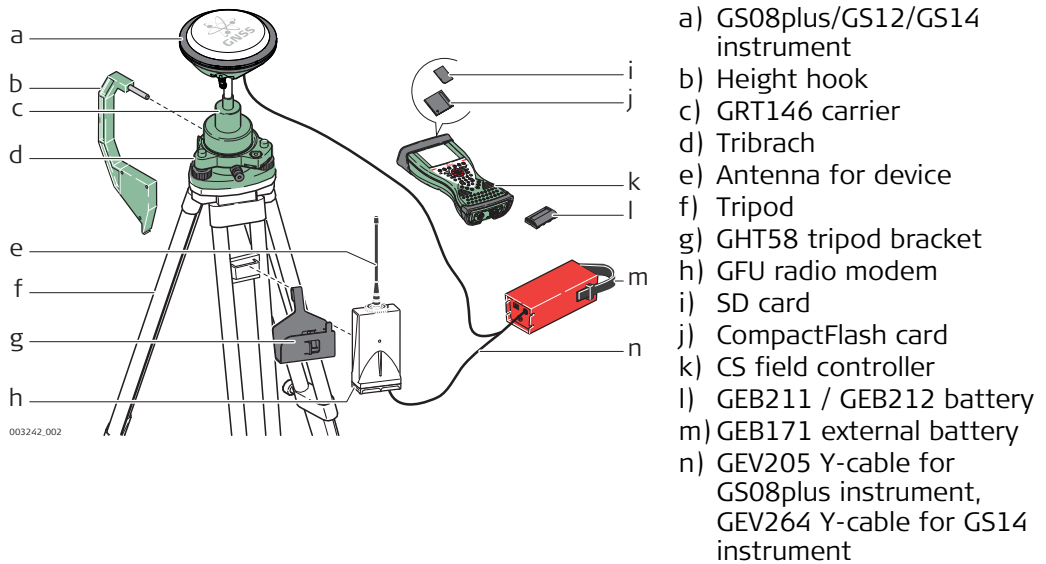


If the instrument is left in the container during use in high temperatures, the lid should be left open. Refer to the User Manual for operating and storage temperatures.

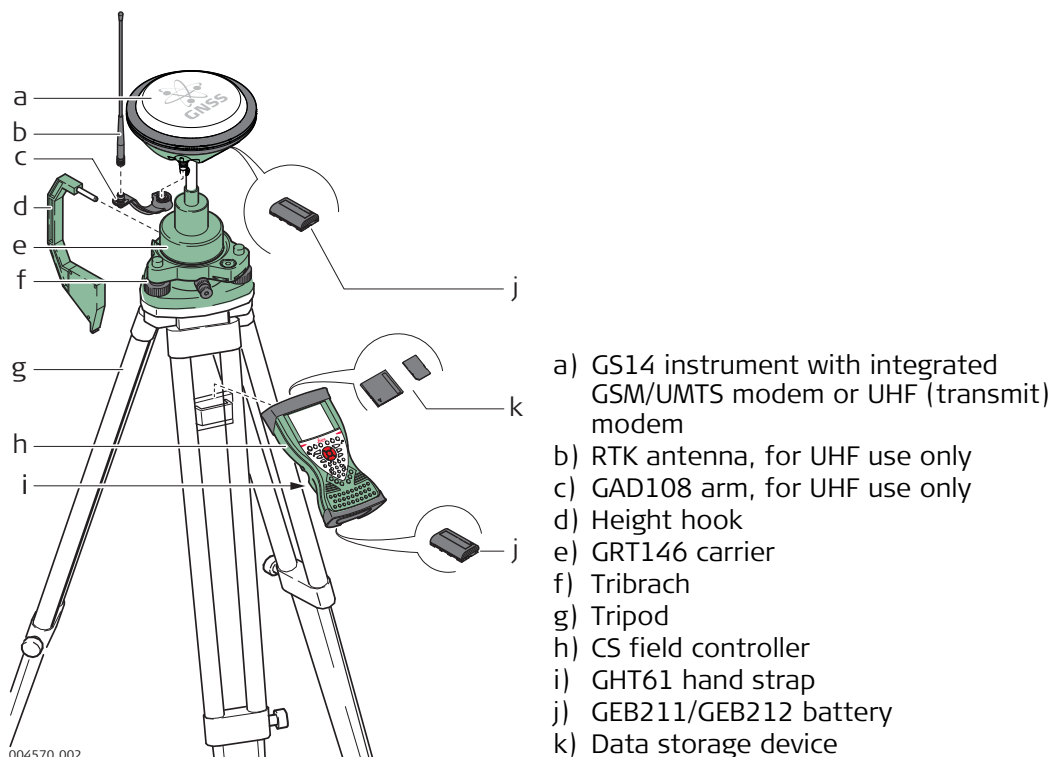


Use an external battery such as GEB171 to ensure operation for a full day.

### Equipment setup - GS08plus/GS12/ GS14



### Equipment setup - GS14 GSM/UMTS or GS14 UHF



## Equipment setup step-by-step

Step	Description		
1.	Set up the tripod.		
2.	Mount and level the tribrach on the tripod.		
3.	Ensure that the tribrach is over the marker.		
4.	Place and lock the carrier in the tribrach.		
	GS10/GS25	GS08plus/GS12/GS14 with external RTK device	GS14/GS15
5.	Screw the GNSS antenna onto the carrier.	Screw the GS08plus/GS12/GS14 onto the carrier.	Insert the data storage device and the batteries into the GS14/GS15.
6.	Check that the tribrach is still level.		Press the ON/OFF button on the instrument for at least 2 s to switch on the instrument.
7.	Insert the SD card and the batteries into the instrument.	Hang the external battery onto a tripod leg.	Screw the GS14/GS15 onto the carrier.
8.	Connect the instrument to the GNSS antenna using the antenna cable and port ANT on the instrument.	Hang the tripod bracket onto a tripod leg and attach the radio housing onto the tripod bracket.	Check that the tribrach is still level.
9.	Connect the CS field controller to the instrument if necessary.	Connect the GEV205 cable to the GS08plus/GS12 or the GEV264 cable to the GS14, to the external battery and to the radio housing.	Insert the SD card or CompactFlash card and the battery into the CS field controller.
10.	To hang the instrument on the tripod leg, use the hook on the rear of the unit. Or place the instrument in the container.	Insert the SD card or CompactFlash card and the battery into the CS field controller.	Connect the CS field controller to the instrument if necessary.
11.	Insert the height hook into the carrier.	Connect the CS field controller to the instrument if necessary.	To hang the CS field controller on the tripod leg, use the hook on the hand strap. Refer to the CS10/CS15 User Manual.
12.	Measure the antenna height using the height hook.	To hang the CS field controller on the tripod leg, use the hook on the hand strap. Refer to the CS10/CS15 User Manual.	Insert the height hook into the carrier.
13.	Clip the antenna arm to the GNSS antenna.	Insert the height hook into the carrier.	Measure the antenna height using the height hook.

Step	Description		
14.	Screw the radio antenna onto the antenna arm.	Measure the antenna height using the height hook.	Press the ON/OFF button on the instrument for at least 2 s to switch on the instrument.
15.	GS10 Attach the radio in its housing to port P2 or P3 on the instrument. GS25 Insert the slot-in radio into port P3 on the instrument.	Press the ON/OFF button on the instrument for at least 2 s to switch on the instrument.	-
16.	Connect the radio antenna to the radio using the second 1.2 m antenna cable.	-	-
17.	Press the ON/OFF button on the instrument for at least 2 s (GS25: 3 s) to switch on the instrument.	-	-

### 4.1.3

### Setting up as a Real-Time Rover

#### Use

The equipment setup is used for real-time rover with extended periods of use in the field.

#### Description

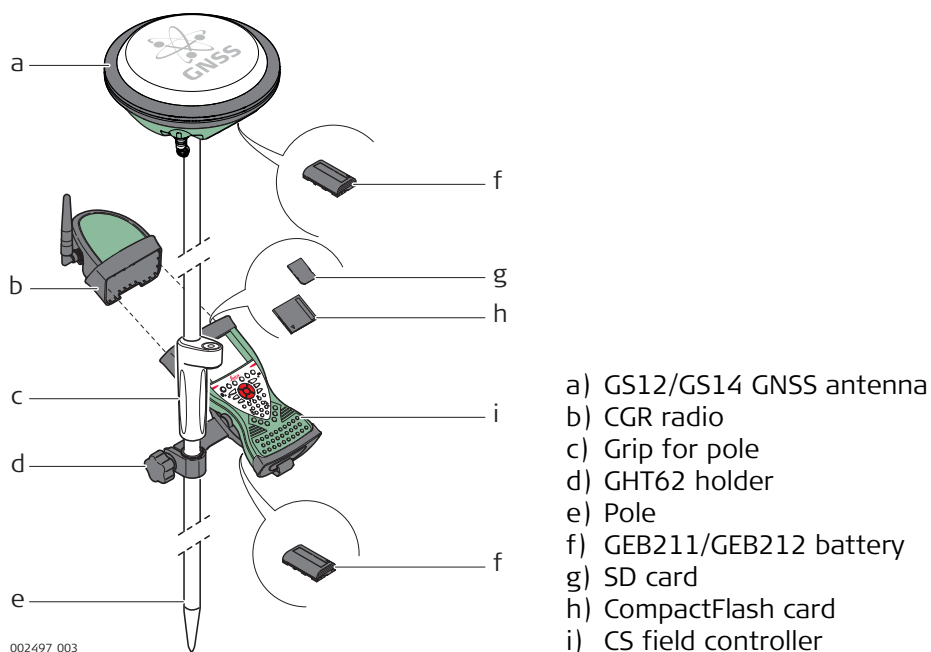
The radio attaches to the instrument (GS10) or is inserted into the instrument (GS25) and is placed in the backpack. Connections are made to the GNSS antenna, radio antenna and CS field controller. The cables coming from the backpack can be disconnected when an obstacle such as a fence has to be crossed.

The CS field controller is fixed to the pole with the GHT62. Connection between the GS12/GS14/GS15/GS08plus instrument and the CS field controller is made through Bluetooth.

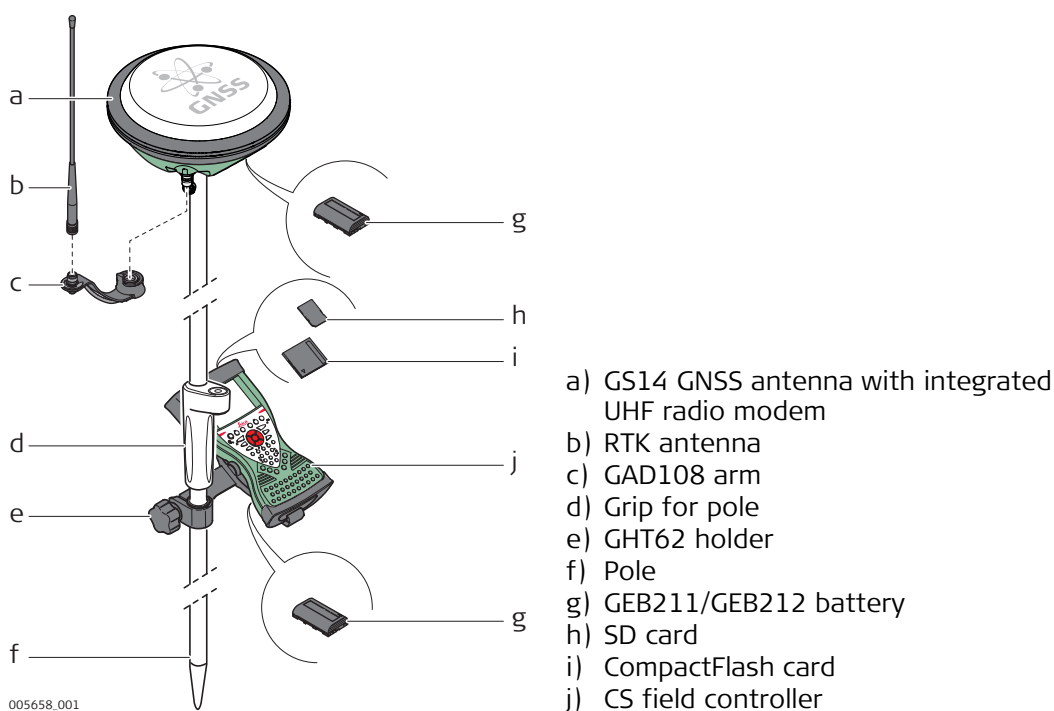


- The antenna is mounted directly using screw fitting. If using stub and adapter, procedures can vary slightly.
- When using the pole with stub, ensure that the antenna and the screw-to-stub adapter slide down the full length of the stub before tightening the locking ring. An incorrectly mounted antenna will have a direct effect on the results.
- Aluminium poles are used. They can be replaced with their carbon fibre equivalent without any change to these instructions.
- Standard radio is used throughout the instructions. Digital cellular phones can also be used but the setup can differ slightly.


## Equipment setup - GS12/GS14



## Equipment setup - GS14 UHF



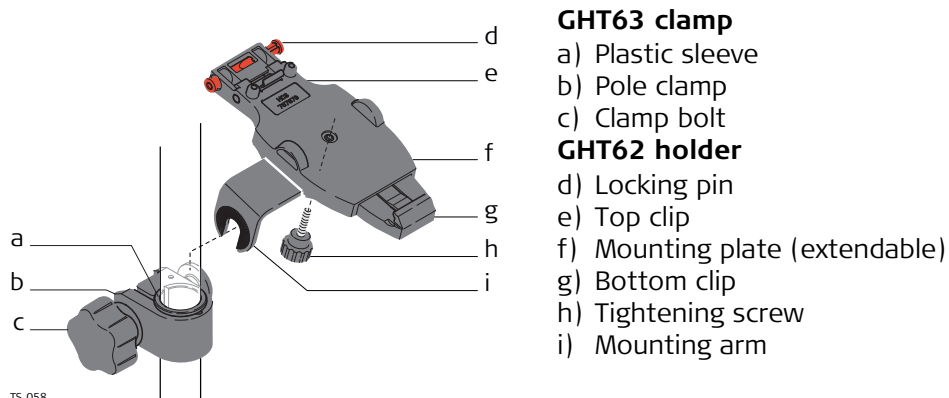
## Equipment setup step-by-step

Step	Description
1.	Attach the GHT62 holder to the pole.
2.	Insert the SD card or CompactFlash card and the battery into the CS field controller.
3.	 For real-time setup with radio: Attach the CGR radio to the CS field controller. Refer to the CS10/CS15 User Manual.
4.	Clip the CS field controller into the holder and lock it by pushing the locking pin into the locked position.
5.	Press ON/OFF button on the CS field controller to switch on.

Step	Description
	Proceed with step 6. for GS10/GS25 and with step 25. for GS12/GS14/GS15/GS08plus.
6.	Screw the GNSS antenna to the top of the pole.
7.	Insert the SD card and the batteries into the instrument.
8.	GS10 Attach the radio in its housing to port P2 or P3 on the instrument. GS25 Insert the slot-in radio into port P3 on the instrument.
9.	Place the instrument in the backpack with the top side facing outwards and the instrument front panel to the top.
10.	Fasten the strap around the instrument.
11.	Push the telescopic rod through the slit in the top of the backpack. Ensure that it is located in the sleeve inside the backpack and push it all the way to the bottom.
12.	Adjust the height of the telescopic rod to suit.
13.	Screw the radio antenna arm onto the telescopic rod.
14.	Connect the first 1.2 m antenna cable to the radio antenna.
15.	Pass the cable through the opening in the top of the backpack and down underneath the instrument.
16.	Connect the first 1.2 m antenna cable to the radio.
17.	Connect the 1.6 m antenna cable to port ANT on the instrument.
18.	Pass the 1.6 m antenna cable through a cable brake and down through the opening in the bottom corner of the backpack flap.
19.	Draw the required amount of cable out of the backpack and tighten the cable brake.
20.	Connect one end of the second 1.2 m antenna cable to the loose end of the 1.6 m antenna cable and the other end to the GNSS antenna.
21.	Connect the 1.8 m, CS to GS cable to the CS field controller.
22.	Pass the 1.8 m, CS to GS cable through the opening in the bottom corner of the backpack flap and up through a cable brake.
23.	Plug it into port P1 on the instrument.
24.	Press ON/OFF button on the instrument to switch on.
	GS12/GS14/GS15/GS08plus.
25.	Insert the data storage device (only GS14/GS15) and the batteries into the GS12/GS14/GS15/GS08plus.
26.	Press ON/OFF button on the GS12/GS14/GS15/GS08plus to switch on.
27.	Screw the GS12/GS14/GS15/GS08plus to the top of the pole.
28.	CS field controller and GS12/GS14/GS15/GS08plus are connected via Bluetooth.

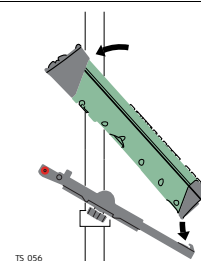
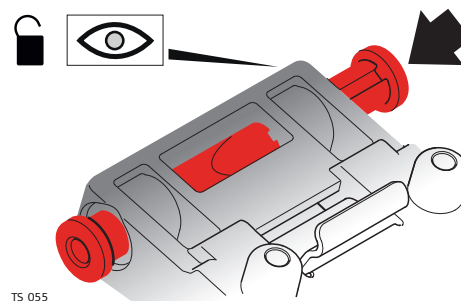
### Components of the GHT62 holder

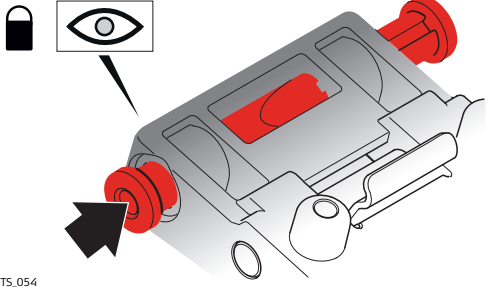
The GHT62 holder consists of some components, as shown in the diagram.



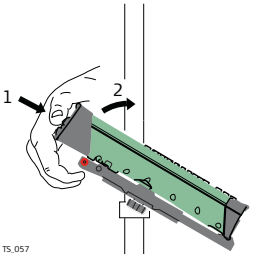
### Fixing the CS field controller and GHT62 to a pole step-by-step

Step	Description
	If you use the CS15 field controller, extend the mounting plate of the holder first.
	For an aluminium pole, fit the plastic sleeve to the pole clamp.
1.	Insert the pole into the clamp hole.
2.	Attach the holder to the clamp using the clamp bolt.
3.	Adjust the angle and the height of the holder on the pole to a comfortable position.
4.	Tighten the clamp with the clamp bolt.
5.	Before the CS field controller is placed onto the mounting plate, ensure that the locking pin is put into the unlocked position. To unlock the locking pin, push the locking pin to the left.
6.	Hold the CS field controller above the holder and lower the end of the CS field controller into the mounting plate.
7.	Apply slight pressure in a downward direction and then lower the top part of the CS field controller until the unit is clicked into the holder. The guides of the mounting plate aid in this action.



Step	Description
8.	<p>After the CS field controller is placed onto the mounting plate, ensure that the locking pin is put into the locked position. To lock the locking pin, push the locking pin to the right.</p>  <p>TS_054</p>

### Detaching the CS from a pole step-by-step

Step	Description
1.	Unlock the locking pin by pushing the locking pin to the left of the mounting plate.
2.	Place palm over the top of the CS until fingers grip the bar of the holder underneath.
3.	Push from the top of the CS toward the bar of the holder.
4.	<p>While in this position, lift the top of the CS from the holder.</p>  <p>TS_057</p>

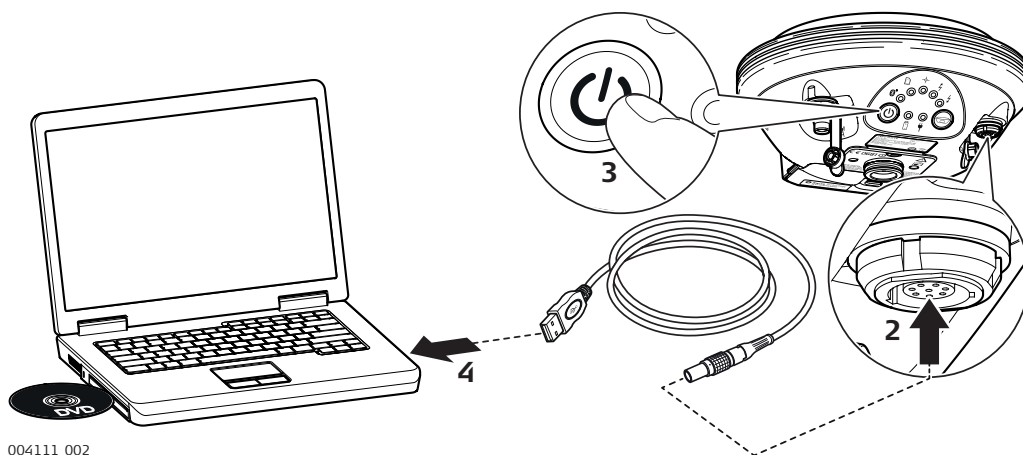


Microsoft ActiveSync (for PCs with Windows XP operating system) or Windows Mobile Device Center (for PCs with Windows Vista or Windows 7/Windows 8 operating system) is the synchronisation software for Windows mobile-based pocket PCs. Microsoft ActiveSync or Windows Mobile Device Center enables a PC and a Windows mobile-based pocket PC to communicate.

### Install Leica Viva USB drivers

Step	Description
1.	Start the PC.
2.	Insert the Leica Viva Series USB card.
3.	Run the <b>SetupViva&amp;GR_USB_XX.exe</b> to install the drivers necessary for Leica Viva devices. Depending on the version (32bit or 64bit) of the operating system on your PC, you have to select between the three setup files following: <ul style="list-style-type: none"> <li>• SetupViva&amp;GR_USB_32bit.exe</li> <li>• SetupViva&amp;GR_USB_64bit.exe</li> <li>• SetupViva&amp;GR_USB_64bit_itanium.exe</li> </ul> The setup has to be run only once for all Leica Viva devices.
4.	The <b>Welcome to InstallShield Wizard for Leica Viva &amp; GR USB drivers</b> window appears.  Ensure that all Leica Viva devices are disconnected from your PC before you continue!
5.	<b>Next&gt;</b> .
6.	The <b>Ready to Install the Program</b> window appears.
7.	<b>Install</b> . The drivers will be installed on your PC.  For PCs with Windows Vista or Windows 7/Windows 8 operating system: If not already installed, Windows Mobile Device Center will be installed additionally.
8.	The <b>InstallShield Wizard Completed</b> window appears.
9.	Check <b>I have read the instructions</b> and click <b>Finish</b> to exit the wizard.

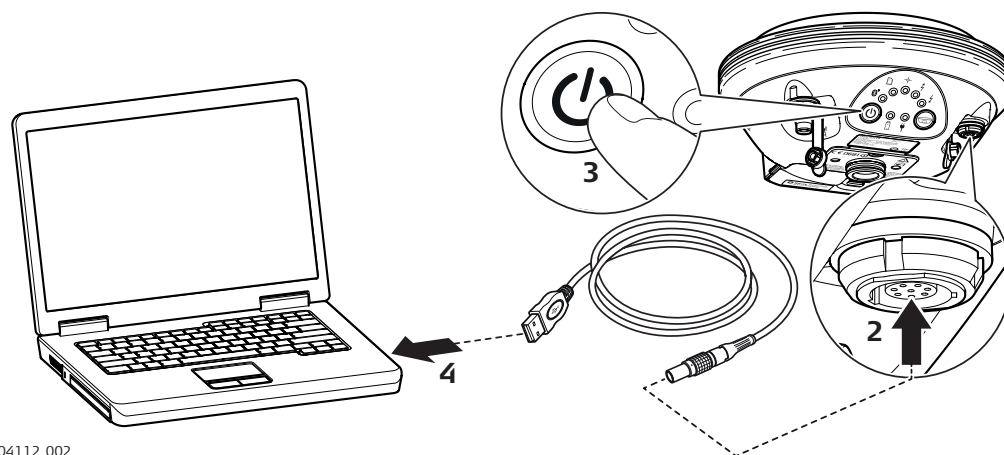
**Connect USB cable  
to PC for the first  
time step-by-step**



004111\_002

Step	Description
1.	Start the PC.
2.	Plug the GEV234 cable into Port P1 of the instrument.
3.	Turn on the instrument.
4.	Plug the GEV234 cable into the USB port of the PC. The <b>Found New Hardware Wizard</b> starts up automatically.
5.	Check <b>Yes, this time only. Next&gt;</b> .
6.	Check <b>Install the software automatically (Recommended). Next&gt;</b> . The software for <b>Remote NDIS based LGS GS Device</b> will be installed on your PC.
7.	<b>Finish.</b>
8.	The <b>Found New Hardware Wizard</b> starts up automatically a second time.
9.	Check <b>Yes, this time only. Next&gt;</b> .
10.	Check <b>Install the software automatically (Recommended). Next&gt;</b> . The software for <b>LGS GS USB Device</b> will be installed on your PC.
11.	<b>Finish.</b>
	For PCs with Windows XP operating system:
12.	Run the ActiveSync installation program if not already installed.
13.	Allow USB connections inside the <b>Connection Settings</b> window of ActiveSync.
	For PCs with Windows Vista or Windows 7 operating system:
14.	Windows Mobile Device Center starts up automatically. If does not start automatically, start Windows Mobile Device Center.

## Connect to PC via USB cable step-by- step




004112\_002

Step	Description
1.	Start the PC.
2.	Plug the GEV234 cable into port P1 of the instrument.
3.	Turn on the instrument.
4.	Plug the GEV234 cable into the USB port of the PC.
	For PCs with Windows XP operating system:
	☞ ActiveSync starts up automatically. If does not start automatically, start ActiveSync. If not already installed, run the ActiveSync installation program.
5.	Allow USB connections inside the <b>Connection Settings</b> window of ActiveSync.
6.	Click <b>Explore</b> in ActiveSync.
	☞ The folders on the GS14 GNSS instrument are displayed under <b>Mobile Devices</b> . The folders of the data storage device can be found in <b>StorageCard</b> .
	For PCs with Windows Vista or Windows 7 operating system:
	☞ Windows Mobile Device Center starts up automatically. If does not start automatically, start Windows Mobile Device Center.

**Description**

The Web server is a web-based tool to view the status of and configure the GNSS instruments. The Web server application is integrated into the GS firmware and cannot be deleted.

**Accessing the Web server via cable step-by-step**


Step	Description
1.	Start the PC and turn on the GS GNSS instrument.  Instead of connecting to your PC, you can connect your GS GNSS instrument to the Leica CS field controller.
2.	Connect the GS GNSS instrument with the GEV234 cable to the PC. Refer to "4.1.5 Connecting to a Personal Computer".
3.	Double-Click the <b>Configure GS connection</b> shortcut from the desktop of your PC. The GS GNSS network adapter is configured with IP address: 192.168.254.1. A DOS window appears when the configuration was successful. Press any key to exit the DOS window. The <b>Configure GS connection</b> shortcut disappears from the desktop.
4.	Start the web browser of your PC.
5.	Type in <b>http://192.168.254.2</b> and press enter to access the web server of GS instrument.

**Accessing the Web server via Bluetooth step-by-step**


To access the Web server the tasks following have to be done:



- Configure the PC's Bluetooth device
- Establish a Bluetooth connection between PC and GS
- Accessing the Web server

**Configuring the PC's Bluetooth device**


Step	Description
1.	Start your PC.
2.	Activate the Bluetooth device of your PC.
3.	Go <b>Start⇒Settings⇒Network Connections</b> .
4.	Double-click <b>Bluetooth</b> from the <b>LAN or High-Speed Internet</b> device list. The <b>Bluetooth Properties</b> windows is started.
5.	In the <b>General</b> page, select <b>Internet Protocol (TCP/IP)</b> from the list and click <b>Properties</b> . The <b>Internet Protocol (TCP/IP) properties</b> windows is started.
6.	Set <b>IP address: 192.168.253.1</b> and <b>Subnet mask: 255.255.255.0</b> and click <b>OK</b> confirm the settings.
	This procedure has to be done only once.

**Establishing a Bluetooth connection between PC and GS GNSS instrument**

Step	Description
1.	Start the PC and turn on the GS GNSS instrument.  Instead of connecting to your PC, you can connect your GS GNSS instrument to the Leica CS field controller. In this case, turn on the Leica CS field controller, start SmartWorx Viva and establish a Bluetooth connection to the GS GNSS instrument.
2.	Run the Bluetooth software and start the <b>Bluetooth Setup Wizard</b> .
3.	Click <b>Next</b> . The <b>Bluetooth Device Selection</b> will be started and an automatic search will be done.

Step	Description
4.	Select the shown GS GNSS instrument and click <b>Next</b> . The Bluetooth Security Setup is started.
5.	Type in <b>0000</b> as <b>Bluetooth security code</b> and click <b>Pair Now</b> . The pairing procedure will be done and the Bluetooth Service Selection is started.
6.	Highlight <b>Personal Ad-hoc Network</b> and check the checkbox for Personal Ad-hoc Network.  Do not select <b>Serial Port</b> as service.
7.	Click <b>Next</b> . The <b>Bluetooth Setup Wizard Completion Page</b> is started.
8.	Type in a name for your GS GNSS instrument and click <b>Finish</b> to complete the <b>Bluetooth Setup Wizard</b> .
	This procedure has to be repeated for every GS GNSS instrument you want to connect to.

### Accessing the Web server

Step	Description
1.	Start the web browser on your PC/CS field controller.  Ensure that your GS GNSS instrument is still running and the Bluetooth connection between PC /CS field controller and GS is established.
2.	Type in <b>192.168.253.2</b> . The Web server is started. You will see the home functions following: <ul style="list-style-type: none"> <li>• <b>Go to Work!</b> <ul style="list-style-type: none"> <li>– To select and start the Wake-up application.</li> </ul> </li> <li>• <b>Current Status</b> <ul style="list-style-type: none"> <li>– To access GNSS information of the GS as well as the instrument firmware.</li> </ul> </li> <li>• <b>Instrument</b> <ul style="list-style-type: none"> <li>– To access configuration settings for the GS.</li> </ul> </li> <li>• <b>User</b> <ul style="list-style-type: none"> <li>– To upload and activate firmware, licence keys and languages.</li> </ul> </li> </ul>

## 4.2

### 4.2.1

## Batteries

### Operating Principles

#### First-time use / Charging batteries

- The battery must be charged prior to using it for the first time.
- The permissible temperature range for charging is between 0°C to +40°C/ +32°F to +104°F. For optimal charging, we recommend charging the batteries at a low ambient temperature of +10°C to +20°C/+50°F to +68°F if possible.
- It is normal for the battery to become warm during charging. Using the chargers recommended by Leica Geosystems, it is not possible to charge the battery if the temperature is too high.
- For Li-Ion batteries, a single refreshing cycle is sufficient. We recommend carrying out a refreshing cycle when the battery capacity indicated on the charger or on a Leica Geosystems product deviates significantly from the actual battery capacity available.

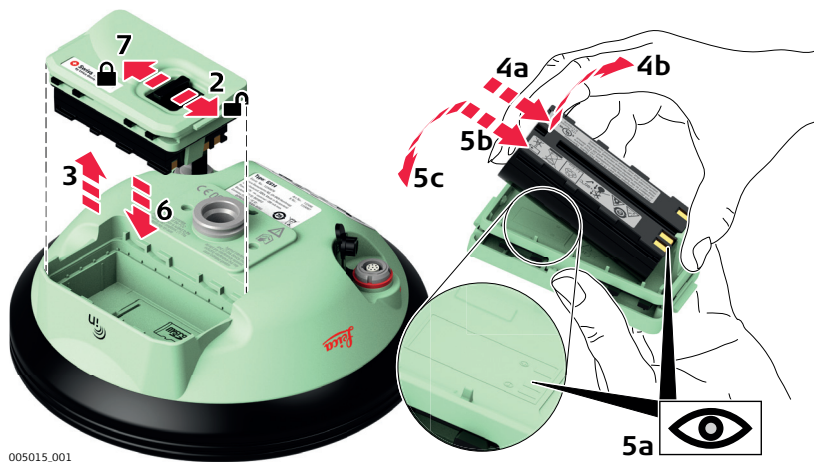
#### Operation / Discharging

- The batteries can be operated from -20°C to +55°C/-4°F to +131°F.
- Low operating temperatures reduce the capacity that can be drawn; high operating temperatures reduce the service life of the battery.

### 4.2.2

### Battery for GS14

#### Change battery step-by-step (GS14)



Step	Description
1.	The battery is inserted in the bottom part of the instrument.
2.	Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol.
3.	Remove the cover from the battery compartment.
4.	Push the battery slightly upwards and at the same time pull out the bottom part of the battery. This releases the battery from its fixed position.
5.	With the battery contacts facing upwards, slide the battery into the cover of the battery compartment. Push the battery upwards so that it locks into position.
6.	Insert the cover of the battery compartment into the compartment.
7.	Push the slide fastener in the direction of the arrow with the close-lock symbol.

## 4.3

## Working with the Memory Device

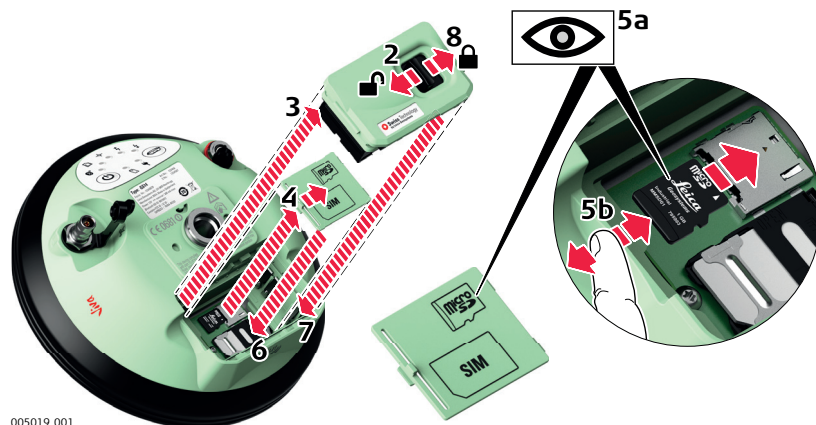


- Keep the card dry.
- Use it only within the specified temperature range.
- Do not bend the card.
- Protect the card from direct impacts.



Failure to follow these instructions could result in data loss and/or permanent damage to the card.

### Insert a microSD card into GS14 step-by-step



005019\_001

Step	Description
	Removing the microSD card while the GS14 is turned on can cause loss of data. Only remove the microSD card or unplug connecting cables when the GS14 is switched off.
1.	The microSD card is inserted into a slot inside the battery compartment of the instrument.
2.	Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol.
3.	Remove the cover from the battery compartment.
4.	Press the latch of the SIM/microSD card cover and remove the cover.
5.	Slide the microSD card with the logo facing upwards firmly into the slot until it clicks into position.
6.	Insert the SIM/microSD card cover to cover slot.
7.	Insert the cover over the battery compartment.
8.	Push the slide fastener in the direction of the arrow with the close-lock symbol.

4.4

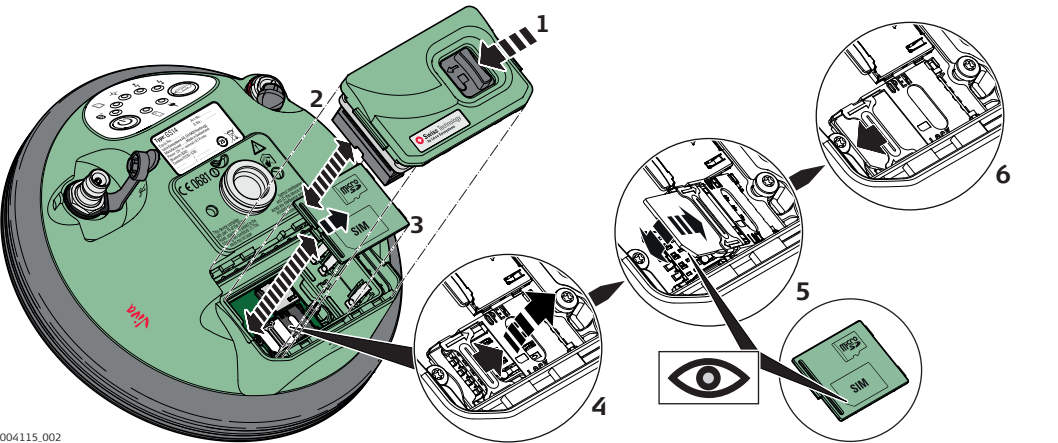
Working with the RTK Device

Devices fitted into the GS14 GNSS instrument

Depending on the GS14 model one or two of the following devices are integrated:

Type	Device
2G GSM	Cinterion BGS2-W
3.75G GSM/UMTS	Cinterion PHS8-P/PHS8-J
3.75G GSM/UMTS	Cinterion PXS8
RX UHF radio	Satel OEM20, receive
RX/TX UHF radio	Satel OEM22, receive/transmit

Insert and remove a SIM card step-by-step



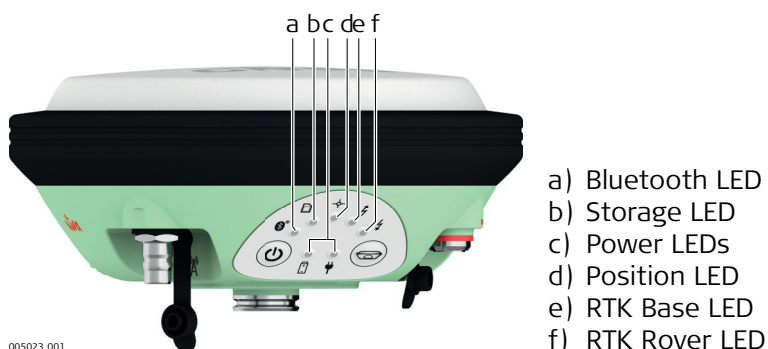
Step	Description
	Inserting/removing the SIM card while the GS14 is turned on can result in permanent damage to the card. Only insert/remove the SIM card when the GS14 is switched off.
	The SIM card is inserted into a slot inside the battery compartment.
1.	Push the slide fastener of the battery compartment in the direction of the arrow with the open-lock symbol.
2.	Remove the cover from battery compartment.
3.	Press the latch of the SIM/microSD card cover and remove the cover.
4.	Push the SIM card holder in the direction of the OPEN arrow and flip it up.
5.	Place the SIM card into the SIM card holder, the chip facing the connectors inside the slot - as shown on the SIM/microSD card cover. Press the SIM card holder down.
6.	Push the SIM card holder in the direction of the LOCK arrow to close.

## LED indicators

## Description

The GS14 GNSS instrument has Light Emitting Diode indicators. They indicate the basic instrument status.

## Diagram



005023.001

## Description of the LEDs

IF the	is	THEN
Bluetooth LED	green	Bluetooth is in data mode and ready for connecting.
	blue	Bluetooth has connected.
Storage LED	off	no microSD card is inserted or GS14 is switched off.
	green	microSD card is inserted but no raw data is being logged.
	flashing green	raw data is being logged.
	flashing red	raw data is being logged but only 5% memory left.
	red	microSD card is full, no raw data is being logged or no microSD card is inserted but GS14 is configured to log raw data.
Position LED	off	no satellites are tracked or GS14 is switched off.
	flashing yellow	less than four satellites are tracked, a position is not yet available.
	yellow	a navigated position is available.
	flashing green	a code-only position is available.
	green	a fixed RTK position is available.
Power LED (active battery <sup>*1</sup> )	off	battery is not connected, flat or GS14 is switched off.
	green	power is 20% - 100%.
	red	power is 5% - 20%. The remaining time for which enough power is available depends on the type of survey, the temperature and the age of the battery.
	fast flashing red	power is low (< 5%).

IF the	is	THEN
Power LED (passive battery <sup>*2</sup> )	off	battery is not connected, flat or the GS14 is switched off.
	flashing green	power is 20% - 100%. LED is green for 1 s every 10 s.
	flashing red	power is less than 20%. LED is red for 1 s every 10 s.
RTK Rover LED	off	GS14 is in RTK base mode or GS14 is switched off.
	green	GS14 is in rover mode. No RTK data is being received at the interface of the communication device.
	flashing green	GS14 is in rover mode. RTK data is being received at the interface of the communication device.
RTK Base LED	off	GS14 is in RTK rover mode or GS14 is switched off.
	green	GS14 is in RTK base mode. No RTK data is being passed to the interface of the communication device.
	flashing green	GS14 is in RTK base mode. Data is being passed to the interface of the communication device.

\*1 The battery, which currently powers the GS14 instrument.

\*2 Other batteries, which are inserted or connected but are not currently powering the GS14 instrument.

## 4.6

### Guidelines for Correct Results with GNSS Surveys

#### Undisturbed satellite signal reception

Successful GNSS surveys require undisturbed satellite signal reception, especially at the instrument which serves as a base. Set up the instrument in locations which are free of obstructions such as trees, buildings or mountains.

#### Steady instrument for static surveys

For static surveys, the instrument must be kept perfectly steady throughout the whole occupation of a point. Place the instrument on a tripod or pillar.

#### Centred and levelled instrument

Centre and level the instrument precisely over the marker.

## 5 Care and Transport

### 5.1 Transport

---

<b>Transport in the field</b>	<p>When transporting the equipment in the field, always make sure that you</p> <ul style="list-style-type: none"><li>• either carry the product in its original transport container,</li><li>• or carry the tripod with its legs splayed across your shoulder, keeping the attached product upright.</li></ul>
<b>Transport in a road vehicle</b>	<p>Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container, original packaging or equivalent and secure it.</p>
<b>Shipping</b>	<p>When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.</p>
<b>Shipping, transport of batteries</b>	<p>When transporting or shipping batteries, the person responsible for the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping, contact your local passenger or freight transport company.</p>

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### 5.2 Storage

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<b>Product</b>	<p>Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "6 Technical Data" for information about temperature limits.</p>
<b>Li-Ion batteries</b>	<ul style="list-style-type: none"><li>• Refer to "Technical Data" for information about storage temperature range.</li><li>• Remove batteries from the product and the charger before storing.</li><li>• After storage recharge batteries before using.</li><li>• Protect batteries from damp and wetness. Wet or damp batteries must be dried before storing or use.</li><li>• A storage temperature range of 0°C to +30°C / +32°F to +86°F in a dry environment is recommended to minimize self-discharging of the battery.</li><li>• At the recommended storage temperature range, batteries containing a 30% to 50% charge can be stored for up to one year. After this storage period the batteries must be recharged.</li></ul>

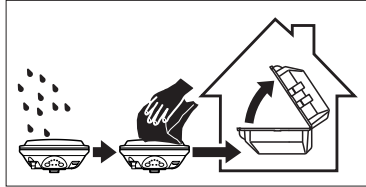
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**Product and accessories**

- Use only a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; these may attack the polymer components.
- 

**Damp products**

Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than 40°C/104°F and clean them. Remove the battery cover and dry the battery compartment. Do not repack until everything is dry. Always close the transport container when using in the field.

**Cables and plugs**

Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.

---

**Connectors with dust caps**

Wet connectors must be dry before attaching the dust cap.

---

## 6

## Technical Data

### 6.1

### GS14 Technical Data

#### 6.1.1

#### Tracking Characteristics

##### Instrument technology

SmartTrack

##### Satellite reception

Dual frequency

##### Supported codes and phases

###### GPS

L1	L2
Carrier phase, C/A-code	Carrier phase, C code (L2C) and P2-code

###### GLONASS

L1	L2
Carrier phase, C/A-code	Carrier phase, P2-code

###### Galileo

E1	E5a	E5b	Alt-BOC
Carrier phase, code	-	-	-

###### BeiDou

B1	B2
Carrier phase, code	Carrier phase, code



Carrier phase and code measurements on L1 and L2 (GPS) are fully independent with AS on or off.

#### 6.1.2

#### Accuracy



Accuracy is dependent upon various factors including the number of satellites tracked, constellation geometry, observation time, ephemeris accuracy, ionospheric disturbance, multipath and resolved ambiguities.

The following accuracies, given as **root mean square**, are based on measurements processed using LGO and on real-time measurements.

The use of multiple GNSS systems can increase accuracy by up to 30% relative to GPS only.

##### Differential code

The baseline precision of a differential code solution for static and kinematic surveys is 25 cm.

**Differential phase  
in post-processing**

Type	Horizontal	Vertical
Static and rapid static	3 mm + 0.5 ppm	5 mm + 0.5 ppm
Kinematic	8 mm + 1 ppm	15 mm + 1 ppm
Static with long observations	3 mm + 0.1 ppm	3.5 mm + 0.4 ppm

**Differential phase  
in real-time**

Type	Horizontal	Vertical
Single Baseline (< 30 km)	8 mm + 1 ppm	15 mm + 1 ppm
Network RTK	8 mm + 0.5 ppm	15 mm + 0.5 ppm

**6.1.3****Technical Data****Dimensions**

Height:	0.090 m
Diameter:	0.190 m

**Weight**

Instrument weight without battery, SIM card and SD card:

Type	Weight [kg]/[lbs]
GS14	0.93/2.04

**Recording**

Data (Leica GNSS raw data and RINEX data) can be recorded on the data storage device.

Type	Capacity [GB]	Data capacity
microSD card	<ul style="list-style-type: none"> <li>1</li> </ul>	1 GB is typically sufficient for about GPS only (12 satellites) <ul style="list-style-type: none"> <li>8000 h L1 + L2 data logging at 15 s rate</li> <li>32000 h L1 + L2 data logging at 60 s rate</li> <li>1440000 real-time points with codes</li> </ul> GPS + GLONASS (12/8 satellites) <ul style="list-style-type: none"> <li>6800 h data logging at 15 s rate</li> <li>27200 h data logging at 60 s rate</li> <li>1440000 real-time points with codes</li> </ul>

**Power**

Power consumption:	GS14, radio excluded: 2.0 W typically, 166 mA (with external battery), 270 mA (with internal battery)
External supply voltage:	Nominal 12 V DC (---, GEV71 car battery cable to a 12 V car battery), voltage range 10.5 V-28 V DC

**Internal battery**

Type:	Li-Ion
Voltage:	7.4 V
Capacity:	GEB212: 2.6 Ah

**Battery external**

Type:	NiMH
Voltage:	12 V
Capacity:	GEB171: 9.0 Ah

## Operating times

The given operating times are valid for

- GS14: instrument; one fully charged GEB212 battery.
- room temperature. Operating times will be shorter when working in cold weather.

Equipment			Operating time
Type	Radio	Digital cellular phone	
Static	-	-	10 h continuously
Rover	Satel OEM20, receive Satel OEM22, receive	-	7 h continuously
	-	Cinterion BGS2-W	6 h continuously
Base	Satel OEM22, transmit	-	5 h continuously
	-	Cinterion BGS2-W Cinterion PHS8-P/PHS8-J Cinterion PXS8	6 h continuously

## Electrical data

Type	GS14
Voltage	-
Current	-
Frequency	GPS: L1, L2 GLONASS: L1, L2 Galileo: E1 BeiDou: B1, B2
Gain	Typically 27 dBi
Noise Figure	Typically < 2 dBi

## Environmental specifications

### Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
Instrument	-40 to +65	-40 to +80
Battery internal	-20 to +55	-40 to +70

### Protection against water, dust and sand

Protection
IP68 (IEC 60529) Dust tight Protected against continuous immersion in water Tested for 2 hours in 1.40 m depth

### Humidity

Protection
Up to 100 % The effects of condensation are to be effectively counteracted by periodically drying out the instrument.

## 6.2

### 6.2.1

## Conformity to National Regulations

### GS14

#### Conformity to national regulations

- FCC Part 15 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the product GS14 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and other applicable European Directives. The declaration of conformity can be consulted at <http://www.leica-geosystems.com/ce>.
- This Class 2 equipment may be operated in: AT, BE, CY, CZ, DK, EE, FI, FR, DE, GR, HU, IE, IT, LV, LT, LU, MT, NL, PL, PT, SK, SI, ES, SE, GB, IS, LI, NO, CH, BG, RO and TR.



Class 2 equipment according European Directive 1999/5/EC (R&TTE) for which following EEA Member States apply restrictions on the placing on the market or on the putting into service or require authorisation for use:

- France
- Italy
- Norway (if used in the geographical area within a radius of 20km from the centre of Ny-Ålesund)
- The conformity for countries with other national regulations not covered by the FCC part 15 or European directive 1999/5/EC has to be approved prior to use and operation.
- Japanese Radio Law and Japanese Telecommunications Business Law Compliance (applicable for Japan).
  - This device is granted pursuant to the Japanese Radio Law and the Japanese Telecommunications Business Law.
  - This device should not be modified (otherwise the granted designation number will become invalid).

#### Frequency band

Type	Frequency band [MHz]
GS14	1227.60 1246.4375 - 1254.3 1575.42 1602.5625 - 1611.5
GS14, Bluetooth	2402 - 2480
GS14, Radio	403 - 473
GS14, 2G GSM	Quad-Band EGSM 850 / 900 / 1800 / 1900
GS14, 3.75G GSM/UMTS	Quad-Band GSM & Penta-Band 800 / 850 / 900 / 1900 / 2100

#### Output power

Type	Output power [mW]
GNSS	Receive only
Bluetooth	5
Radio	1000
2G GSM EGSM850/900	2000
2G GSM GSM1800/1900	1000
2G GSM	GPRS multi-slot class 10 (max. 2/8 TX)
3.75G GSM	E(dge)GPRS multi-slot class 12 (max. 4/8 TX)
3.75G UMTS 800/850/900/1900/2100	250

## Antenna

Type	Antenna	Gain [dBi]
GNSS	Internal GNSS antenna element (receive only)	-
Bluetooth	Internal Microstrip antenna	2 max.
UHF	External antenna	-
GSM/UMTS	Integrated antenna	0 max. @ 800 / 850 / 900 3 max. @ 1800 / 1900 / 2100

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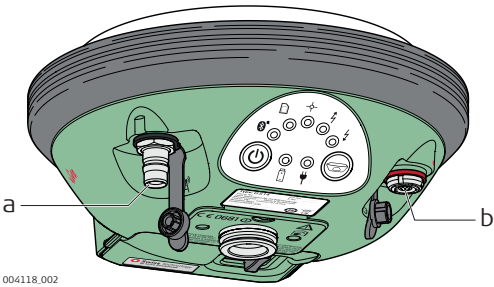
Appendix A

Pin Assignments and Sockets

Description

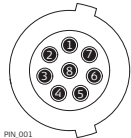
Some applications require knowledge of the pin assignments for the instrument ports. In this chapter, the pin assignments and sockets for the instrument ports are explained.

Ports at the instru-  
ment underside



- a) QN-connector, only for models with  
UHF radio
- b) Port 1 (USB and serial)

Pin assignments for  
port P1



Pin	Signal Name	Function	Direction
1	USB_D+	USB data line	In or out
2	USB_D-	USB data line	In or out
3	GND	Signal ground	-
4	RxD	RS232, receive data	In
5	TxD	RS232, transmit data	Out
6	ID	Identification pin	In or out
7	PWR	Power input, 10.5 V-28 V	In
8	GPIO	RS232, general-purpose signal	In or out

Sockets

Port 1:

LEMO-1, 8 pin, LEMO HMI.1B.308.CLWP



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- when it has to be **right**

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